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TRANSMITTAL LETTER TO THE UNITED STATES DESIGNATED/ELECTED OFFICE (DO/EO/US) CONCERNING A FILING UNDER 35 U.S.C. §371		U.S. APPLICATION NO. (if known, see back of cover sheet) [NEW] 107030420
International Application No. PCT/JP00/04631	International Filing Date July 11, 2000	Priority Date Claimed July 13, 1999
<b>Title of Invention</b> METHOD FOR WASHING FOODSTUFF WITH ACTIVATED WATER		
<b>Applicant(s) For DO/EO/US</b> Kei USUI		
<p>Applicant herewith submits to the United States Designated/Elected Office (DO/EO/US) the following items and other information:</p> <ol style="list-style-type: none"> <li>1. <input checked="" type="checkbox"/> This is a <b>FIRST</b> submission of items concerning a filing under 35 U.S.C. §371.</li> <li>2. <input type="checkbox"/> This is a <b>SECOND</b> or <b>SUBSEQUENT</b> submission of items concerning a filing under 35 U.S.C. §371.</li> <li>3. <input checked="" type="checkbox"/> This express request to begin national examination procedures (35 U.S.C. §371(f)) at any time rather than delay examination until the expiration of the applicable time limit set in 35 U.S.C. §371(b) and PCT Articles 22 and 39(1).</li> <li>4. <input checked="" type="checkbox"/> A proper Demand for International Preliminary Examination was made by the 19th month from the earliest claimed priority date.</li> <li>5. <input checked="" type="checkbox"/> A copy of the International Application as filed (35 U.S.C. §371(c)(2)) <ul style="list-style-type: none"> <li>a. <input type="checkbox"/> is transmitted herewith (required only if not transmitted by the International Bureau).</li> <li>b. <input checked="" type="checkbox"/> has been transmitted by the International Bureau.</li> <li><input checked="" type="checkbox"/> is not required, as the application was filed in the United States Receiving Office (RO/US)</li> </ul> </li> <li>6. <input checked="" type="checkbox"/> A translation of the International Application into English (35 U.S.C. §371(c)(2)). <b>ATTACHMENT A</b></li> <li>7. <input type="checkbox"/> Amendments to the claims of the International Application under PCT Article 19 (35 U.S.C. §371(c)(3)). <ul style="list-style-type: none"> <li>a. <input type="checkbox"/> are transmitted herewith (required only if not transmitted by the International Bureau).</li> <li>b. <input type="checkbox"/> have been transmitted by the International Bureau.</li> <li>c. <input type="checkbox"/> have not been made; however, the time limit for making such amendments has NOT expired.</li> <li>d. <input type="checkbox"/> have not been made and will not be made.</li> </ul> </li> <li>8. <input type="checkbox"/> A translation of the amendments to the claims under PCT Article 19.</li> <li>9. <input checked="" type="checkbox"/> An oath or declaration of the inventor(s) (35 U.S.C. §371(c)(4)). <b>ATTACHMENT B</b></li> <li>10. <input type="checkbox"/> A translation of the annexes to the International Preliminary Examination Report under PCT Article 36 (35 U.S.C. §371(c)(5)).</li> </ol> <p><b>Items 11. to 14. below concern other document(s) or information included:</b></p> <ol style="list-style-type: none"> <li>11. <input checked="" type="checkbox"/> An Information Disclosure Statement under 37 CFR 1.97 and 1.98. <b>ATTACHMENT C</b></li> <li>12. <input type="checkbox"/> An assignment document for recording. A separate cover sheet in compliance with 37 CFR 3.28 and 3.31 is included.</li> <li>13. <input type="checkbox"/> A <b>FIRST</b> preliminary amendment. <ul style="list-style-type: none"> <li><input type="checkbox"/> A <b>SECOND</b> or <b>SUBSEQUENT</b> preliminary amendment.</li> </ul> </li> <li>14. <input checked="" type="checkbox"/> Other items or information: <ol style="list-style-type: none"> <li>a. Cover Page of Published International Application No. WO01/03522 - <b>ATTACHMENT D</b></li> <li>b. International Search Report - <b>ATTACHMENT E</b></li> </ol> </li> </ol>		

U.S. APPLICATION NO. [NEW] <b>10/030420</b>	INTERNATIONAL APPLICATION NO. PCT/JP00/04631	ATTORNEY'S DOCKET NO. 2001-1862A																
15. [X] The following fees are submitted		CALCULATIONS      PTO USE ONLY																
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<table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="width: 25%;">Claims</th> <th style="width: 25%;">Number Filed</th> <th style="width: 25%;">Number Extra</th> <th style="width: 25%;">Rate</th> </tr> </thead> <tbody> <tr> <td>Total Claims</td> <td>2 -20 =</td> <td>0</td> <td>X \$18.00</td> </tr> <tr> <td>Independent Claims</td> <td>1 - 3 =</td> <td>0</td> <td>X \$84.00</td> </tr> <tr> <td colspan="2">Multiple dependent claim(s) (if applicable)</td> <td></td> <td>+ \$280.00</td> </tr> </tbody> </table>		Claims	Number Filed	Number Extra	Rate	Total Claims	2 -20 =	0	X \$18.00	Independent Claims	1 - 3 =	0	X \$84.00	Multiple dependent claim(s) (if applicable)			+ \$280.00	
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19. CORRESPONDENCE ADDRESS   <b>000513</b> PATENT TRADEMARK OFFICE		By: <i>Warren Cheek</i> Warren M. Cheek, Jr., Reg. No. 33,867 for Matthew Jacob, Reg. No. 25,154  WENDEROTH, LIND & PONACK, L.L.P. 2033 "K" Street, N.W., Suite 800 Washington, D.C. 20006-1021 Phone:(202) 721-8200 Fax:(202) 721-8250  January 10, 2002																

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## DESCRIPTION

METHOD FOR WASHING FOODSTUFF WITH ACTIVATED WATER

## 5 Technical Field

The present invention relates to a method for the improvement of quality of a foodstuff or restoration of the quality of a foodstuff which suffers a loss of freshness or degradation of the taste due to damages on the texture caused, for example, by contacting with certain noxious substances such as chlorine contained in city water in the course of processing including washing with water. In particular, the method comprises washing of the degraded foodstuff with water activated by a specific method which is effective to restore the quality of the foodstuff from damages and to impart the foodstuff with long-term preservability as well as to impart the foodstuff with increased deliciousness resulting in upgrading of the foodstuff quality.

20

## Background Art

It is known that, differently from ordinary water including city water and the water coming directly from a so-called natural water source such as springs and wells, water can be converted into so-called "activated" water having unique properties not found in the raw water per se and capable of exhibiting specific activity to living organisms when the raw water is subjected to an electric or physical treatment such as electrolysis and ultrasonic irradiation and to a chemical treatment with an oxidizing agent or reducing agent as well as to a contacting treatment with a specific mineral.

For example, electrolysis of city water results in the formation of alkalified water and acidified water at the anode side and at the cathode side, respectively, which can be taken out separately. It is generally accepted that the thus alkalified water exhibits activities for freshness

preservation of foodstuffs and growth promotion of plants while the acidified water exhibits a microbicidal effect against various kinds of microorganisms.

Although no good understanding has yet been obtained on 5 the mechanism for the "activation" of ordinary water by an electrical, physical or chemical treatment, it is presumable that the mechanism could be explained in terms of partial oxidation and reduction of water molecules, dissociation of associated water molecules, localization of electric charges 10 on the water molecules, existence of free radicals such as active hydrogen and active oxygen, and so on.

One of the methods for the production of such activated water in a large volume utilizable in industrial applications is the electrolysis of water by using a 15 large-capacity electrolytic cell. This electrolytic method, however, is far from industrial practicability in a process where supply of a large volume of activated water is essential as in the production of bean sprouts as a foodstuff because the process of electrolysis per 20 se is operated in a batch process. In addition, the electrolysis voltage in the electrolytic process cannot exceed the decomposition voltage of water giving a limitation to the conditions for imparting negative charges so that the efficiency for the production of activated 25 water is necessarily low with an unduly prolonged treatment time.

It is also known, on the other hand, that foodstuffs in general are subject to damages of the texture by contacting with various kinds of noxious substances in the course of 30 processing or in the course of washing with water resulting in the disadvantages of rotting and degradation of taste.

The present invention has been completed with an object to provide a simple and efficient method for the preparation of "activated" water capable of exhibiting an advantageous 35 physiological effect on the bodies of animals and plants as well as to provide a method for quality upgrading of the quality of various kinds of foodstuffs by restoration from

damages on the textures and cells caused in the course of food processing or in the course of washing with water.

#### Disclosure of Invention

5       The inventor has conducted extensive investigations on the method by which various kinds of foods can be imparted with upgraded quality or preservability over a long period of time or by which the taste of the food can be improved arriving at an unexpected discovery that these objects can  
10 be accomplished when the food is washed with water which has been activated by contacting with a hydrogen-absorbing alloy as a consequence of restoration from damages in the texture of the foodstuff leading to quality upgrading as an object of the invention.

15      Thus, the present invention provides a method for quality upgrading of a foodstuff which comprises the step of subjecting the foodstuff to a washing treatment with water activated by being contacted with a hydrogen-absorbing alloy.

20      Brief Description of the Drawing

Figure 1 is a schematic axial cross sectional view of an apparatus for the preparation of the activated water used in the inventive method.

25      Figure 2 is a schematic axial cross sectional view of another apparatus for the preparation of the activated water used in the inventive method.

#### Best Mode for Carrying Out the Invention

30      The hydrogen-absorbing alloy implied here for use in the inventive method includes metals and alloys which are in the form of a hydride combined with the metal or alloy by a physical mechanism such as adsorption and absorption or by a reversible chemical reaction.

35      While a great variety of hydrogen-absorbing alloys are known heretofore, those having the largest general applicability are the palladium-based alloys containing palladium

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as the principal ingredient including palladium-niobium alloys, palladium-gold alloys and palladium-silver alloys optionally with further additional alloying metals such as ruthenium, rhodium and the like. Although the simple metal of palladium can occlude about 800 times by volume of hydrogen at room temperature, a serious problem therein is the unavoidable hydrogen embrittlement. This is the reason for the preference of the palladium-based alloys mentioned above to the simple metal of palladium. Although any of the above mentioned palladium-based alloys can be used in the inventive method without particular limitations, palladium-silver alloys are more preferable among them. The weight proportion of palladium and the other alloying metallic elements in the palladium-based hydrogen-absorbing alloy is from 30 to 80% of palladium and from 70 to 20% of the other metals.

While the form of these hydrogen-absorbing alloys for use in the inventive method is not particularly limitative, it is preferable that the alloy is supported on a porous carrier material including porous ceramic carriers and porous plastic carriers. The porous ceramic carrier is exemplified by sintered alumina, sintered silica, sintered silica-alumina, zeolites, "shirasu" pearlite and the like. The porous plastic carrier is exemplified by foamed polystyrenes, foamed polyethylenes, foamed polyurethanes and the like. Various methods can be undertaken for the palladium-based alloy to be supported on the surface of the porous carrier material including the methods of electrolytic plating, electroless plating, chemical vapor deposition, vacuum vapor deposition, sputtering and the like. The film thickness of the palladium-based alloy thus supported on the surface of the porous carrier material is in the range from 1 to 150  $\mu\text{m}$  or, preferably, from 10 to 100  $\mu\text{m}$ .

Since palladium-based alloys are generally soluble in an acid, it is desirable that, when the palladium-based alloy is used according to the inventive method under possible contacting with an acid, the surface of the palladium-

based alloy is coated with a layer of an acid-resistant metal, which is preferably gold, in a film thickness of 0.2 to 2  $\mu\text{m}$ . While full prevention can be obtained against the attack of acid to the alloy with the gold plating film 5 of such a small thickness, the rates of hydrogen absorption and desorption to and from the alloy are little affected by the gold plating layer.

Absorption and desorption of hydrogen to and from the palladium-based hydrogen-absorbing alloy can be effected by utilizing the difference in the temperature and/or pressure. Namely, the palladium-based alloy has a capacity to absorb hydrogen under the conditions of low temperatures and high pressures and releases the absorbed hydrogen under the conditions of high temperatures and low pressures.

Accordingly, the palladium-based alloy loaded with hydrogen absorbed therein used in the inventive method is obtained by bringing the alloy at a low temperature into contact with pressurized hydrogen gas so as to have the hydrogen gas absorbed in the alloy before the hydrogen-loaded alloy is brought into contact with water at an increased temperature or under a reduced pressure to release hydrogen which activates the water. The water here to be activated need not be free water but can be in the form of an aqueous mixture with an oily substance or with an organic solvent although the advantages by the use of such an aqueous mixture over the use of plain water can be obtained only in limited cases because the conditions for absorption and desorption of hydrogen largely depend on the types of the aqueous mixtures.

30 Following is a description of a practicing example for the preparation of "activated" water used in the inventive method by making reference to the accompanying drawing.

Figure 1 is a schematic axial cross sectional view of a water-activating reactor suitable for activation of water for use in the inventive method. The reactor consists basically of a cylindrical vessel 1 opening at the right and left end plates and connected there to the water-feed

tube 2 having a stopcock 2A and a side branch 3 for hydrogen inlet with a stopcock 3A and to the water-takeout tube 4, respectively. The space in the cylindrical vessel 1 between the perforated plates 5A,5B is filled with chips 8 of the 5 hydrogen-absorbing alloy to form an alloy-filled bed 6. The cylindrical vessel 1 is surrounded by a temperature-controlling means 7 which can be a coolant- or heating medium-circulating jacket or a heater element assembly. A preferable example of the alloy chips 8 is a tubular 10 ring of sintered porous alumina having an outer diameter of 3 to 50 mm and a length of 5 to 100 mm and supporting a layer of the hydrogen-absorbing palladium-silver alloy having a thickness of about 20  $\mu\text{m}$  formed by vapor deposition and coated with a plating film of gold. The form of 15 the alloy chips 8 is not limited to the above but can be any suitable forms including spheres, plates and rods.

The procedure for the preparation of the "activated" water by using the above described reactor is as follows. In the first place, the reactor vessel 1 holding a packed 20 bed 6 of the alloy chips 8 is chilled from outside by means of the coolant-circulating jacket 7 and, when a desired low temperature of the alloy chips 8 has been reached, hydrogen gas from an appropriate source is introduced through the inlet tube 3 with the stopcock 3A being opened and the stopcock 2A being closed into the reactor vessel 1 through the packed bed 6 of the alloy chips 8 so as to have the hydrogen 25 gas absorbed by the alloy chips 8. When equilibrium has been established between the hydrogen-loaded alloy chips 8 and the flowing hydrogen gas so that absorption of hydrogen 30 gas by the alloy chips 8 can no longer proceed, the flow of the hydrogen gas through the packed bed 6 is switched to a flow of water through the water-feed tube 2 by opening the stopcock 2A and closing the stopcock 3A concurrently with switching of the coolant through the jacket 7 to a heating 35 medium at an elevated temperature so as to effect desorption of the hydrogen gas absorbed by the alloy chips 8. The flowing water is activated by being contacted with the

nascent hydrogen as the so-called active hydrogen on the alloy chips 8 and taken out from the water-takeout tube 4 to be used in the inventive method.

Following is a further description of the method for 5 the preparation of activated water by using the apparatus schematically illustrated in Figure 2 by an axial cross sectional view of the apparatus which basically comprises a jacket tube 11 having a water-feed tube 2 and a water- takeout tube 4 in the vicinities of the right and left end 10 portions, respectively, and surrounding a blind tube 9 made from a gas-permeable porous ceramic material and provided on the outer surface with a coating layer 10 of the hydrogen-absorbing alloy having a thickness of 2 to 100 µm.

The apparatus illustrated in Figure 2 is run by passing 15 water through the jacket tube 11 from the water-feed tube 2 to the water-takeout tube 4 while the blind tube 9 is filled with pressurized hydrogen gas so that the hydrogen gas permeates the porous ceramic wall of the blind tube 9 to be absorbed by the layer 10 of the hydrogen-absorbing 20 alloy and then released at the outer surface of the alloy layer 9 under normal pressure to activate the water in contact therewith.

In practicing the inventive method for the treatment of a foodstuff with the activated water, the above described 25 water-activating reactor is installed at an appropriate site from which a necessary volume of the activated water is supplied as the washing water for foods by passing raw water through the reactor at an appropriate flow rate. The optimum time length for washing foods with the activated 30 water depends on the kind of the foodstuffs. When the food is a meat or fish, for example, the washing time should be as short as possible in the range of 1 to 5 seconds in order to avoid any damages on the tissues of the meat or fish. The washing time for vegetables and cereals can be 35 extended to 1 to 10 minutes by which restoration of damaged texture can be expected. The washings after the washing

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treatment of foods can be discharged as such without particular problems relative to environmental pollution though dependent on the nature of the foods washed with the activated water. In some cases, the washings can be returned 5 to the reactor for water activation to be suitable for reuse.

In the following, the method of the present invention is described in more detail by way of Examples for a variety of foodstuffs as preceded by a Reference Example describing 10 preparation of activated water.

Reference Example.

The water-activating reactor used in the Examples basically had a structure illustrated in Figure 2. Thus, a reactor tube was constructed from a stainless steel jacket 15 tube 11 having an inner diameter of 0.3 meter and a length of 4 meters which surrounded a plurality of blind tubes 9 of a sintered porous alumina ceramic each having an outer diameter of 20 mm and a length of 3.6 meters and provided on the outer surface with a coating layer 10 of a palladium-20 silver alloy of 10  $\mu\text{m}$  thickness and a 1  $\mu\text{m}$  thick plating film of gold thereon. Hydrogen gas was introduced under pressurization to  $8.8 \times 10^5$  Pa into the porous alumina tubes 9 at a rate of 1 liter per minute at 15 °C while water taken from a well was passed through the jacket tube 11 at a flow 25 rate of 1000 liters per minute to be taken out as activated water.

Example 1.

A 355 g portion of Japonica-type rice after 3 times washing with the activated water was soaked for 30 minutes 30 in 400 ml of the activated water and then cooked in an electric rice cooker to prepare cooked rice, referred to as the inventive cooked rice hereinafter.

Separately for comparison, the same rice cooking procedure was undertaken as above excepting for the replacement 35 of the activated water with ordinary city water to prepare the comparative cooked rice.

The cooking yields for the inventive cooked rice and comparative cooked rice were 2.152 and 2.135, respectively. Some improvements could be noted in the appearance, i.e. color tone and glossiness, of the inventive cooked rice just cooked as compared with the comparative cooked rice.

After keeping for 24 hours and 48 hours at 25 °C, microbial counting tests were undertaken for these cooked rice samples for overall viable number of bacteria and number of colon bacilli to find that, while absolutely no colon bacilli could be detected in each of the samples even after keeping for 48 hours, the overall viable number of bacteria, which was zero in each of the samples just as cooked, was as shown in Table 1 below.

Table 1

Cooked rice	Overall viable bacteria		
	as cooked	after 24 hours	after 48 hours
Inventive	0	$3.5 \times 10^3$	$7.8 \times 10^5$
Comparative	0	$6.3 \times 10^4$	$5.2 \times 10^7$

As is understood from this table, the viable number of bacteria could be substantially decreased after keeping for 24 hours and 48 hours in the inventive cooked rice as compared with the comparative cooked rice to maintain freshness of the food over a substantially extended time. The mechanism therefor is presumable that the activated water has an activity to suppress hydrolysis of rice starch resulting in a decreased production of monosaccharides which can be a factor for promoting growth of bacteria.  
Example 2.

Chopped pieces of Japanese radish in an amount of 100 kg a lot were immersed for 10 minutes in city water (comparative) or in the activated water (inventive) followed

- 10 -

by centrifugal dehydration at 800 rpm for 60 seconds and weight measurement of the dehydrated radish chops to calculate the yield. This test was undertaken for 10 lots with city water and for 10 lots with the activated water.

5 The results are shown in Table 2.

Table 2

Lot No.	Yields, %	
	Comparative	Inventive
1	92.1	98.8
2	93.3	96.2
3	93.1	97.8
4	92.4	97.2
5	94.4	96.3
6	95.1	98.8
7	91.8	97.5
8	93.3	96.3
9	92.5	98.4
10	92.8	96.5
Average	93.1	97.4

This table indicates that an improvement of 4.3% can be  
30 obtained in the yield of radish chops by using the activated  
water as compared with the city water.

Example 3.

Preservation tests of chopped vegetable pieces were  
undertaken for onions, cucumbers and lettuces after washing  
35 with city water (comparative) or with the activated water  
(inventive) and microbial inspection was undertaken to count

the overall viable number of bacteria and number of colon bacilli. The storage temperature was 2 °C for the first 24 hours, 8 °C for the second 24 hours and 10 °C for the third 24 hours. The results are shown in Table 3.

Table 3

Chopped vege- table pieces	Pres- erva- tion, hours	Comparative		Inventive	
		Overall viable bacteria	Coliform bacteria	Overall viable bacteria	Coliform bacteria
Onion	as washed	$4.4 \times 10^3$	$1.4 \times 10^3$	$1.2 \times 10^4$	< 10
	24	$4.7 \times 10^2$	$5.8 \times 10^2$	$1.8 \times 10^3$	$3.9 \times 10$
	48	$2.5 \times 10^3$	$5.7 \times 10^2$	$7.1 \times 10$	< 10
	72	$1.9 \times 10^4$	$6.3 \times 10^3$	$3.1 \times 10^2$	< 10
Cucum- ber	as washed	$1.7 \times 10^3$	$6.0 \times 10$	$6.4 \times 10^3$	10
	24	$3.7 \times 10^2$	$1.0 \times 10^2$	$8.0 \times 10^3$	< 10
	48	$5.0 \times 10^2$	$2.6 \times 10^2$	$7.2 \times 10^3$	< 10
	72	$1.1 \times 10^4$	$6.3 \times 10^3$	$6.0 \times 10^3$	< 10
Lettuce	as washed	$1.7 \times 10^4$	$9.0 \times 10$	$2.3 \times 10^3$	10
	24	$6.2 \times 10^3$	< 10	$3.4 \times 10^2$	< 10
	48	$2.2 \times 10^3$	$1.3 \times 10^2$	$1.1 \times 10^3$	$2.0 \times 10^2$
	72	$2.3 \times 10^3$	$6.9 \times 10^2$	$3.0 \times 10^3$	$5.0 \times 10$

The results relative to growth suppression of coliform bacteria by the activated water suggest that the activated

water has activity to reduce production of monosaccharides which may be produced when vegetable tissues are destroyed or damaged.

Example 4.

5 Preservation test of rib beefs was undertaken at 4 °C after washing with city water (comparative) or with the activated water (inventive) over a period of 15 days with periodical counting of the overall viable number of bacteria per gram of the meat to give the results shown in Table 4.

10

T a b l e 4

Preser- vation, days	Overall viable number of bacteria per gram	
	Comparative	Inventive
0	$7.1 \times 10^4$	$7.4 \times 10^3$
3	$8.2 \times 10^4$	$1.4 \times 10^3$
6	$1.3 \times 10^5$	$9.3 \times 10^2$
8	$1.4 \times 10^6$	$1.9 \times 10^4$
10	$4.5 \times 10^6$	$4.3 \times 10^4$
13	$7.6 \times 10^7$	$1.2 \times 10^4$
15	$1.1 \times 10^8$	$1.8 \times 10^5$

30 As is indicated in Table 4, a substantial improvement can be obtained in the preservability of meat by washing with the activated water.

Example 5.

35 A preservation test of whole cabbages at 10 °C was undertaken after washing with city water (comparative) or with the activated water (inventive) to give the results

shown in Tables 5A and 5B for the microbial tests and the organoleptic and visual tests, respectively.

Thus, inspection of the cabbages was undertaken periodically during the storage period over 8 days for the 5 items including, in addition to the numbers of bacteria, unpleasant smell, juice dripping, appearance of brownish leaves and appearance of blackened leaves. The results in each of these organoleptic and visual items were recorded 10 in three ratings of A, B and C according to the criteria of: A for the same condition as just washed; B for a condition with a slight degradation but retaining the commercial value; and C for a condition not suitable for use as a food.

Table 5A

Preser- vation, days	Inventive		Comparative	
	Overall viable bacteria	Coliform bacteria	Overall viable bacteria	Coliform bacteria
Before washing	$1.9 \times 10^6$	$3.1 \times 10^4$	$1.9 \times 10^6$	$3.1 \times 10^4$
As washed	0	0	$1.8 \times 10^2$	0
1	$6.1 \times 10$	0	$2.1 \times 10^4$	$6.0 \times 10^2$
2	$2.3 \times 10^2$	0	$1.2 \times 10^5$	$9.9 \times 10^3$
3	$2.5 \times 10^2$	$1.1 \times 10$	$2.5 \times 10^5$	$1.2 \times 10^4$
4	$1.3 \times 10^3$	$2.7 \times 10^2$	$1.8 \times 10^6$	$3.5 \times 10^5$
5	$2.7 \times 10^4$	$4.2 \times 10^3$	$5.9 \times 10^7$	$5.5 \times 10^6$
6	$1.6 \times 10^5$	$8.5 \times 10^4$	$2.4 \times 10^8$	$7.1 \times 10^7$
8	$2.7 \times 10^6$	$9.8 \times 10^5$	$7.6 \times 10^{10}$	$8.9 \times 10^9$

Table 5B

Pres- er- va- tion, days	Inventive				Comparative			
	Smell	Drip- ping	Brown leaves	Black- ened leaves	Smell	Drip- ping	Brown leaves	Black- ened leaves
1	A	A	A	A	A	A	A	A
2	A	A	A	A	A	A	A	A
3	A	A	A	A	A	A	A	Partial- ly B
4	A	A	A	A	A	B	B	B
5	A	A	A	Partial- ly B	A	B	C	C
6	A	A	A	Partial- ly B	A	B	C	C
8	B	B	C	C	B	B	C	C

As is shown in these tables, substantial improvements can be obtained not only in the microbial tests but also 25 in the organoleptic and visual tests by washing with the activated water.

#### Example 6.

"Mozuku", an edible seaweed of the family Spermatophytae, in an amount of 1.5 kg was treated in the 30 following manner with the activated water (inventive) or with city water (comparative). Thus, the seaweed was taken in a glass bowl of 4 liter capacity which was filled with the water and the ramified seaweed was thoroughly disintegrated by hand in the water. The seaweed was taken 35 in a draining basket and the water was thoroughly drained from the seaweed. After twice repeating this procedure, the

seaweed was freed from free water as completely as possible on a draining basket.

A 125 g portion taken from the thus treated seaweed and diluted three times with addition of water was taken 5 in a container with covering and stored in a refrigerator at 5 °C. After 2 days of storage, the seaweed was taken out of the container and tested for the visual appearance, tastiness and chew feeling to find that, although no differences were noted in the visual appearance and chew feeling 10 between the samples after washing with the activated water and with the city water, a clear difference could be noted in the tastiness therebetween, the seaweed after washing with the activated water being superior to that after washing with the city water.

15 Thereafter, the container was again covered and kept in the refrigerator for additional 24 hours and the seaweed samples taken out of the container were subjected to the same organoleptic tests as above to find that, while no noticeable changes were found in the seaweed after treatment 20 with the activated water as compared with the results in the tests after 2 days storage, denaturation had clearly proceeded in the visual appearance of the seaweed after treatment showing mushy appearance.

The results of the further organoleptic tests under-  
25 taken after two more days of storage in the refrigerator were about the same as those in the above mentioned second evaluation tests excepting for further proceeding of degradation in the tastiness and chew feeling of the seaweed after treatment with the city water.

30 Example 7.

A 500 g portion of fresh "ikra", i.e. disintegrated salmon eggs, as just landed was taken in a draining basket and the basket was put into a washing machine to have the "ikra" washed for 1 minute in a stream of running water 35 with the activated water (inventive) or with city water (comparative).

The thus washed salmon eggs were dipped and kept overnight in a seasoning sauce prepared by using the activated water or the same city water, respectively, at 10 °C followed by measurement of the thus seasoned salmon eggs.

5 The results are shown in Table 6.

Further, the same sample of the seasoned salmon eggs was freeze-stored at -30 °C followed by thawing and second measurement of the weight of the thus thawed salmon eggs.

The results are shown also in Table 6.

10

T a b l e 6

	As seasoned		As thawed	
	weight, g	yield, %	weight, g	yield, %
Inventive	582	116.4	436	87.2
Comparative	562	112.4	428	85.6

As is indicated in Table 6, substantial improvements can be obtained in the yield of the seasoned salmon eggs by the treatment with the activated water as a result of  
25 a decrease in the dripping from the eggs which also means an improvement in the quality thereof as a food product.

Industrial Applicability

The inventive method provides a means for greatly  
30 improving the quality of various foodstuffs by washing the foodstuff with activated water obtained in a simple method.

## CLAIMS

1. A method for improving the quality of a foodstuff which comprises the step of subjecting the foodstuff to a washing treatment with activated water prepared by contacting water with a hydrogen-absorbing alloy.
2. The method for improving the quality of a foodstuff as claimed in claim 1 in which the hydrogen-absorbing alloy is a palladium-based alloy.

FIG. 1

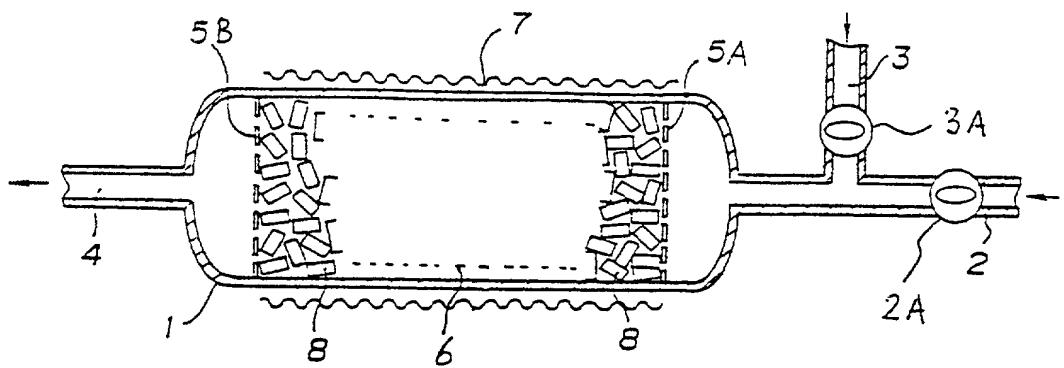
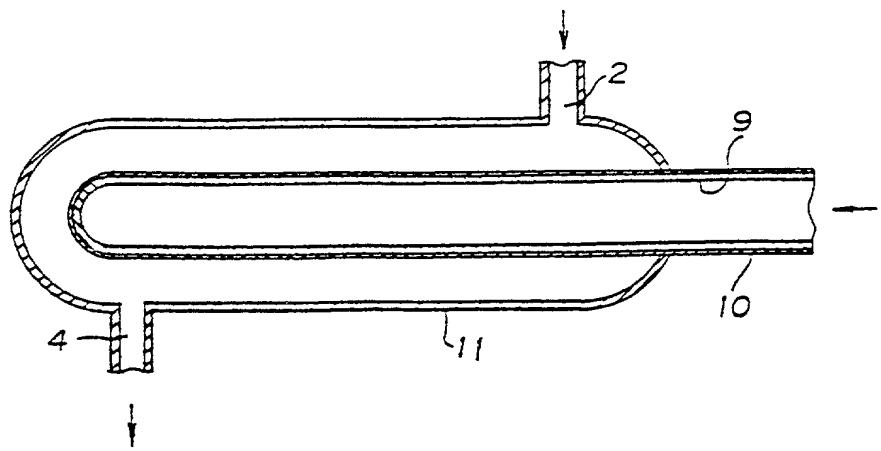


FIG. 2



## DECLARATION AND POWER OF ATTORNEY FOR U.S. PATENT APPLICATION

( ) Original ( ) Supplemental ( ) Substitute (X) PCT ( ) Design

As a below named inventor, I hereby declare that: my residence, post office address and citizenship are as stated below next to my name; that I verify belief that I am the original, first and sole inventor (if only one name is listed below) or an original, first and joint inventor (if plural inventors are named below) of the subject matter which is claimed and for which a patent is sought on the invention entitled:

Title: METHOD FOR WASHING FOODSTUFF WITH ACTIVATED WATER

of which is described and claimed in:

- ( ) the attached specification, or
- ( ) the specification in the application Serial No. \_\_\_\_\_ filed \_\_\_\_\_;
- and with amendments through \_\_\_\_\_ (if applicable), or
- (X) the specification in International Application No. PCT/JP00/04631, filed July 11, 2000, and as amended on \_\_\_\_\_ (if applicable).

I hereby state that I have reviewed and understand the content of the above-identified specification, including the claims, as amended by any amendment(s) referred to above.

I acknowledge my duty to disclose to the Patent and Trademark Office all information known to me to be material to patentability as defined in Title 37, Code of Federal Regulations, '1.56.

I hereby claim priority benefits under Title 35, United States Code, '119 (and '172 if this application is for a Design) of any application(s) for patent or inventor's certificate listed below and have also identified below any application for patent or inventor's certificate having a filing date before that of the application on which priority is claimed:

COUNTRY	APPLICATION NO.	DATE OF FILING	PRIORITY CLAIMED
Japan	11-199604	July 13, 1999	Yes

I hereby claim the benefit under Title 35, United States Code '120 of any United States application(s) listed below and, insofar as the subject matter of each of the claims of this application is not disclosed in the prior United States application in the manner provided by the first paragraph of Title 35, United States Code '112, I acknowledge the duty to disclose information material to patentability as defined in Title 37, Code of Federal Regulations, '1.56 which occurred between the filing date of the prior application and the national or PCT international filing date of this application.

APPLICATION SERIAL NO.	U.S. FILING DATE	STATUS: PATENTED, PENDING, ABANDONED

Full Name of Fifth Inventor	FAMILY NAME	FIRST GIVEN NAME	SECOND GIVEN NAME
Residence & Citizenship	CITY	STATE OR COUNTRY	COUNTRY OF CITIZENSHIP
Post Office Address	ADDRESS	CITY	STATE OR COUNTRY ZIP CODE

Full Name of Sixth Inventor	FAMILY NAME	FIRST GIVEN NAME	SECOND GIVEN NAME
Residence & Citizenship	CITY	STATE OR COUNTRY	COUNTRY OF CITIZENSHIP
Post Office Address	ADDRESS	CITY	STATE OR COUNTRY ZIP CODE

Full Name of Seventh Inventor	FAMILY NAME	FIRST GIVEN NAME	SECOND GIVEN NAME
Residence & Citizenship	CITY	STATE OR COUNTRY	COUNTRY OF CITIZENSHIP
Post Office Address	ADDRESS	CITY	STATE OR COUNTRY ZIP CODE

I further declare that all statements made herein of my own knowledge are true, and that all statements on information and belief are believed to be true; and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under Section 1001 of Title 18 of the United States Code, and that such willful false statements may jeopardize the validity of the application or any patent issuing thereon.

1st Inventor Kei' usui Date December 11, 2001  
 Kei USUI

2nd Inventor \_\_\_\_\_ Date \_\_\_\_\_

3rd Inventor \_\_\_\_\_ Date \_\_\_\_\_

4th Inventor \_\_\_\_\_ Date \_\_\_\_\_

5th Inventor \_\_\_\_\_ Date \_\_\_\_\_

6th Inventor \_\_\_\_\_ Date \_\_\_\_\_

7th Inventor \_\_\_\_\_ Date \_\_\_\_\_

The above application may be more particularly identified as follows:

U.S. Application Serial No. \_\_\_\_\_ Filing Date \_\_\_\_\_  
 Applicant Reference Number \_\_\_\_\_ Atty Docket No. \_\_\_\_\_  
 Title of Invention \_\_\_\_\_

And I hereby appoint Michael R. Davis, Reg. No. 25,134; Matthew M. Jacob, Reg. No. 25,154; Warren M. Cheek, Jr., Reg. No. 33,367; Nils Pedersen, Reg. No. 33,145; Charles R. Watts, Reg. No. 33,142, and Michael S. Huppert, Reg. No. 40,268, who together constitute the firm of WENDEROTH, LIND & PONACK, L.L.P., as well as any other attorneys and agents associated with Customer No. 000513, to prosecute this application and to transact all business in the U.S. Patent and Trademark Office connected therewith.

I hereby authorize the U.S. attorneys and agents named herein to accept and follow instructions from Agata Patent Office, as to any action to be taken in the U.S. Patent and Trademark Office regarding this application without direct communication between the U.S. attorneys and myself. In the event of a change in the persons from whom instructions may be taken, the U.S. attorneys named herein will be so notified by me.

Direct Correspondence to Customer No:   000513 PATENT TRADEMARK OFFICE	Direct Telephone Calls to:  WENDEROTH, LIND & PONACK, L L P 2033 "K" Street, N W , Suite 800 Washington, D C 20006-1021  Phone (202) 721-8200 Fax (202) 721-8250
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Full Name of First Inventor	FAMILY NAME USUI	FIRST GIVEN NAME Kei	SECOND GIVEN NAME
Residence & Citizenship	CITY Tokyo	STATE OR COUNTRY Japan	COUNTRY OF CITIZENSHIP Japan
Post Office Address	ADDRESS 1712-158, Oaza Minamiyoshimi, Yoshimi-machi, Hiki-gun, Saitama 355-0154 Japan	CITY	STATE OR COUNTRY ZIP CODE

Full Name of Second Inventor	FAMILY NAME	FIRST GIVEN NAME	SECOND GIVEN NAME
Residence & Citizenship	CITY	STATE OR COUNTRY	COUNTRY OF CITIZENSHIP
Post Office Address	ADDRESS	CITY	STATE OR COUNTRY ZIP CODE

Full Name of Third Inventor	FAMILY NAME	FIRST GIVEN NAME	SECOND GIVEN NAME
Residence & Citizenship	CITY	STATE OR COUNTRY	COUNTRY OF CITIZENSHIP
Post Office Address	ADDRESS	CITY	STATE OR COUNTRY ZIP CODE

Full Name of Fourth Inventor	FAMILY NAME	FIRST GIVEN NAME	SECOND GIVEN NAME
Residence & Citizenship	CITY	STATE OR COUNTRY	COUNTRY OF CITIZENSHIP
Post Office Address	ADDRESS	CITY	STATE OR COUNTRY ZIP CODE